

STATE OF ILLINOIS
ILLINOIS COMMERCE COMMISSION

Verizon North Inc. (f/k/a/ GTE North)	
Incorporated) and Verizon South Inc.)	
(formerly known as GTE South Incorporated))	
)	Docket No. 00-0812
Petition seeking approval of cost studies)	
for unbundled network elements, avoided)	
costs and intrastate switched access services.)	

TESTIMONY OF
MICHAEL J. BOYLES

On Behalf of
AT&T Communications of Illinois, Inc.

AT&T Exhibit 2.00

PUBLIC VERSION

OCTOBER 12, 2001

TABLE OF CONTENTS

I. INTRODUCTION.....	1
II. SUMMARY	4
III. ICM SWITCHING ISSUES	9
A. Technology Selection Issues	10
B. Investment Issues	12
C. Growth Issues.....	17
D. Switching Cost Model Input Issues.....	18
E. Factors Issues	19
IV. ICM COST CALCULATION ISSUES.....	20
V. ICM INPUT ADJUSTMENTS AND RESTATEMENT.....	21
VI. COMPARISON OF RESTATED COSTS TO OTHER VERIZON COSTS	24
VII. CONCLUSIONS.....	25

1 **I. INTRODUCTION**

2 **Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.**

3 A. My name is Michael J. Boyles. My business address is 66 Canal Center Plaza;
4 Suite 670; Alexandria, VA 22314.

5 **Q. BY WHOM ARE YOU EMPLOYED AND IN WHAT CAPACITY?**

6 A. I am employed by FTI Consulting, Inc. as a Manager.

7 **Q. PLEASE DESCRIBE YOUR EDUCATION AND WORK EXPERIENCE.**

8 A. I received a Bachelor of Science and Engineering degree from Princeton
9 University in 1983, with a concentration in Engineering and Management
10 Systems. I began my career as a programmer for a management consulting firm.
11 In 1985, I joined a technology development firm managing the design and
12 implementation of computer systems to improve operations and asset
13 management for transportation companies. I also quantified and analyzed
14 potential merger synergies and provided data analysis and litigation support
15 services.

16 I joined Klick, Kent & Allen, Inc. in 1996, which was subsequently acquired by
17 FTI Consulting, Inc. ("FTI") in 1998. FTI provides engineering and cost analyses
18 for a variety of industries. Many of these analyses have been submitted in
19 administrative proceedings, in court, and in arbitration proceedings. These
20 analyses – which have included studies of stand-alone costs, short-run and long-
21 run incremental costs and short-run marginal costs – have often employed
22 complex, computer-driven cost models incorporating detailed engineering input

1 data and sophisticated discounted cash flow techniques. In 1996, FTI was
2 retained by AT&T and MCI to assist in analyzing the cost evidence being
3 submitted in various proceedings arising out of the Telecommunications Act of
4 1996.

5 **Q. PLEASE BRIEFLY SUMMARIZE YOUR RECENT EXPERIENCE THAT**
6 **IS RELEVANT TO THIS PROCEEDING.**

7 A. I have had extensive experience with large, computerized databases and the
8 development and critique of computer models. In addition, because many of
9 these models have been presented in the context of litigation, I have often had to
10 analyze models sponsored by opposing parties to determine the extent to which I
11 believe them to be deficient. I have then quantified and corrected for these
12 deficiencies. The following are examples of some of the projects that my firm has
13 undertaken in these areas.

14 Since 1996, FTI has been heavily involved in analyzing Incumbent Local
15 Exchange Carrier ("ILEC") cost studies for AT&T/WorldCom in several states
16 including Pennsylvania, Texas, Oklahoma, California, New Jersey, Washington,
17 Oregon, Iowa, Nebraska, Minnesota, Delaware, West Virginia, Virginia, and
18 Maryland. FTI has also critiqued the FCC's Synthesis Model. These efforts have
19 involved the evaluation of the sponsored cost models, modification of inputs and
20 algorithms, and re-running of those models. Much of that work has resulted in
21 written and oral testimony evaluating the LEC models.

22 I have been extensively involved in the review and critique of Verizon's and
23 Southwestern Bell's use of switching cost models in a variety of jurisdictions.

1 Those switching costs models are the same models used here by Verizon, namely,
2 the Switching Cost Information System (“SCIS”) developed by Telcordia and the
3 CostMod system developed by GTE Corporation.

4 **Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?**

5 A. In connection with this proceeding, AT&T Communications of Illinois, Inc.
6 (“AT&T”) requested that I analyze the cost studies and cost models submitted by
7 Verizon. The purpose of my testimony is to respond to certain statements and
8 assertions made by Verizon witnesses Tucek and Dye as contained in the prefiled
9 testimony presented to this Commission in December 2000. I critique a variety of
10 elements of the Integrated Cost Model (“ICM”) sponsored by Mr. Tucek. Where
11 possible, I correct the inputs to the ICM model and quantify the effects on the
12 switched access cost elements included in attachment TD-5 to Mr. Dye’s
13 testimony. Specifically, because AT&T requested that I pay particular attention
14 to the switched access cost elements whose investments are developed by the
15 SCIS and CostMod models and input into ICM, I have not attempted to identify
16 and isolate each and every flaw throughout ICM. An analysis which focuses on
17 other costs developed through Verizon’s ICM may identify a multitude of
18 problems over and above the ones I discuss in my testimony.

19 **Q. HOW IS YOUR TESTIMONY ORGANIZED?**

20 A. The remainder of my testimony is organized into seven sections. Section II
21 summarizes my conclusions. Section III addresses general modeling issues
22 within ICM. Section IV addresses ICM, SCIS and CostMod switching issues.
23 Section V addresses issues regarding the way in which Verizon calculates costs.

1 Section VI addresses my recommendations on what adjustments could be made to
2 compensate for some of the shortcomings I identified in the models and presents
3 the costs derived by using those adjustments to restate Verizon's costs using ICM.
4 Section VII compares the restated cost results to other costs developed by
5 Verizon. Section VIII presents my overall conclusion regarding the use of ICM in
6 Illinois.

7 **II. SUMMARY**

8 **Q. PLEASE SUMMARIZE YOUR TESTIMONY.**

9 A. The ICM sponsored by Verizon in this proceeding is neither as flexible nor as
10 open as Verizon contends. The inflexibility of ICM and the closed nature of some
11 elements of ICM greatly inhibit the testability of the model. Nevertheless, I found
12 a number of serious flaws in the switching module of ICM, which was the
13 primary focus of my review. These flaws include:

- 14 ~~/s/~~ General ICM modeling issues;
- 15 ~~/s/~~ ICM technology selection issues;
- 16 ~~/s/~~ ICM investment issues;
- 17 ~~/s/~~ ICM growth issues;
- 18 ~~/s/~~ Switching model input issues; and
- 19 ~~/s/~~ ICM factors issues.

20 Where possible, I adjusted ICM to correct these flaws and recalculated the
21 switched access costs. While the resulting end office switching costs and tandem
22 switching costs are less than those proposed here by Verizon, the tandem
23 switching costs are higher than the Verizon's current switched access tandem

1 switching costs. This result is puzzling because it contradicts the observation that
2 switching costs, in general, are dropping¹. Because I did not undertake a thorough
3 analysis of any other ICM modules, I cannot comment on the costs ICM
4 calculates for the other switched access cost elements. However, due to the
5 number of flaws I found in the ICM switching module, at a minimum, I
6 recommend that the Commission should reject ICM as the cost modeling tool to
7 establish forward-looking switched access costs for Verizon in Illinois.

8 **III. ICM GENERAL MODELING ISSUES**

9 **Q. DO YOU AGREE THAT IT IS IMPORTANT FOR A FORWARD-**
10 **LOOKING COST MODEL TO REFLECT VERIZON'S ENGINEERING**
11 **PRACTICES AND OPERATING CHARACTERISTICS?**

12 A. No. Verizon claims that its costs studies comply fully with the FCC's TELRIC
13 methodology, but asserts that unless a cost model reflects Verizon's engineering
14 practices and operating characteristics, it cannot produce realistic estimates of
15 Verizon's forward-looking costs in Illinois². However, such an approach is
16 inconsistent with the proper application of the TELRIC methodology, which
17 requires that the costs of an *efficient* carrier be modeled³.

18 The modeled network should be able to satisfy demand efficiently without
19 building excessive capacity, regardless of what facilities Verizon actually has in

20

¹ Given that switching costs in general are dropping, the modified cost results identified here should be viewed by the Commission as a cost *ceiling*.

² Tucek, pages 2-3 and 6.

³ While Verizon reserves its right to propose new UNE rates after the legal issue of the appropriate cost model methodology is resolved at the federal level [Tucek, page 3], this testimony addresses the methodology Verizon presented in these cost studies. Any other methodologies adopted by Verizon will be addressed after they are presented.

1 place. To do otherwise would establish costs based upon the inefficient use of
2 resources, which only serves to unnecessarily increase costs and is inconsistent
3 with behavior observed in competitive markets. The Illinois Cost of Service
4 Rules address principles to be followed in performing long-run service
5 incremental cost (“LRSIC”) studies. The Rules explicitly address the issue of
6 efficient versus actual costs, stating:

7 Forward-looking costs are the costs to be incurred by a carrier in
8 the provision of a service. These costs shall be calculated as if the
9 service were being provided for the first time and shall reflect
10 planned adjustments in the firm’s plant and equipment. Forward-
11 looking costs ignore embedded or historical costs; rather, they are
12 based on the least cost technology currently available whose cost
13 can be reasonably estimated based on available data.⁴

14 The Illinois Commerce Commission (“ICC”) confirmed this in its most recent
15 order addressing Ameritech’s UNE prices stating that:

16 The FCC firmly rejected arguments that the prices must or should
17 include any difference between the embedded costs LECs have
18 incurred and the economic costs of those elements and services,
19 concluding that forward-looking economic cost-based prices would
20 best ensure the efficient investment decisions and competitive
21 entry contemplated by the Act. We agree. To include residual in
22 UNE prices is completely antithetical to competition because
23 competitors would be forced to pay more than the economic costs
24 of the elements they purchase, thereby discouraging competitors as
25 efficient as or even more efficient than the incumbent LEC from
26 entering the market. None of the varied arguments offered in
27 support of the residual increment proposals are persuasive.⁵

28 Therefore, Verizon should have excluded any of its own inefficiencies to the
29 extent that they are included in these cost studies, but I see no indication that it

⁴ 83 Illinois Administrative Code, Part 791, Cost of Service, Section 791.20 c) (August 1, 1995).

⁵ Second Interim Order, Docket Nos. 96-0486/0569 (Consol.), p. 70 (February 17, 1998).

1 has done so. In particular, as I discuss below, Verizon has not excluded any
2 inefficiencies with respect to the selection of the switching technologies.

3 **Q. WHAT COST MODEL FEATURES DOES VERIZON CLAIM WILL**
4 **FACILITATE THE COMMISSION'S DETERMINATION OF**
5 **FORWARD-LOOKING COSTS IN ILLINOIS?**

6 A. Verizon claims that the ICM should be used to determine forward-looking costs in
7 Illinois because it has the advantages of testability, flexibility, complete openness
8 to inspection, and internal integration⁶.

9 **Q. DO YOU AGREE THAT ICM PROVIDES THE ADVANTAGES OF**
10 **FLEXIBILITY, TESTABILITY AND COMPLETE OPENESS TO**
11 **INSPECTION?**

12 A. No. There are inputs to ICM that are not flexible or readily open to inspection,
13 which means the model is characterized, at best, as having limited testability. For
14 example, there is significant processing of the SCIS and CostMod switching
15 model outputs in order to create the switching investment tables used by ICM.
16 The retail switching investment table in ICM used for calculating UNE costs
17 contains over 18,600 records.⁷ Verizon produced over 20,000 pages of output
18 reports from the SCIS and CostMod models that are used to populate this ICM
19 table. A single change to the inputs of SCIS and CostMod would require
20 reproducing all of this supporting documentation and manually re-entering this
21 information into the ICM switch investment table before the results of that single
22 change to the costs generated by ICM can be assessed. No interface has been

⁶ Tucek, page 6.

⁷ Refer to ilswinvr.db provided by Verizon.

1 created to automate this process. This significantly inhibits the practical
2 feasibility of conducting sensitivity studies of ICM.

3 While it is true that a user can change other inputs of ICM, these are limited to
4 only those elements that Verizon thinks might be changed. For example, in the
5 outside plant distribution run-time options of ICM, the user has the choice of
6 selecting a drop size of 3 or 5 wires. However, a user cannot select a 2 wire drop
7 because that is not one of the options available. This again limits the flexibility
8 and testability of ICM.

9 Additionally, there are elements of ICM that are part of its core processing that
10 cannot be changed by employing different input values. For example, although I
11 focused my analysis principally on switched access costs, I note that the use of a
12 K-mean clustering algorithm to increase or decrease the number of clusters in
13 order to insure that the copper loop length restriction is satisfied cannot be
14 changed without significant modifications to the source programming code of the
15 model.

16 Furthermore, I was unable to independently audit how ICM calculates its
17 switched access end office switching investment. I used a combination of the
18 ICM switching algorithms produced by Verizon, the ICM mapping code for
19 products and services which is viewable from ICM, and the ICM source code as
20 references. Based on these, I recreated the equations for calculating the end office
21 switching investment for a particular wirecenter in an Excel spreadsheet using
22 investment and factor elements from ICM tables. Even so, I could not replicate

1 the end office switching investments by CLLI produced by ICM. My inability to
2 replicate and, therefore, audit the investments calculation is a disadvantage of
3 ICM.

4 Lastly, Verizon produced supporting documentation that was not completely open
5 to inspection. Since most of the documents were in a PDF format, any
6 calculations within the underlying spreadsheets that made up these documents
7 were neither reviewable or changeable⁸. While these documents can often be re-
8 engineered, I was unable to determine how the processor utilization factors were
9 developed based upon the material provided by Verizon. Production of PDF files
10 instead of the fully-useable worksheets they represent is not consistent with the
11 provision of a model that is “completely open to inspection.”

12 **III. ICM SWITCHING ISSUES**

13 **Q. WHAT WERE YOUR FINDINGS WITH RESPECT TO THE ICM** 14 **SWITCHING MODULE?**

15 A. I found significant flaws in the switching module, including problems with the
16 technology selection of switches, the discounts applied to switch purchases, the
17 reflection of growth in switching, the inputs to the switching cost models used to
18 create ICM input tables, and the factors used by ICM.

⁸ PDF files are viewed using Adobe® Acrobat®.

1 **A. Technology Selection Issues**

2 **Q. WHAT DO YOU MEAN WHEN YOU SAY THAT THERE IS A**
3 **PROBLEM WITH THE TECHNOLOGY SELECTION OF SWITCHES**
4 **USED BY ICM?**

5 A. In ICM, Verizon models switches that in my opinion are too large for the wire
6 centers they serve. Verizon uses one of four switching technology types for each
7 wire center, *i.e.* the 5ESS made by Lucent, the DMS-10 and DMS-100 made by
8 Nortel and the GTD-5 made by AGCS. The 5ESS, DMS-100 and GTD-5
9 switches can each accommodate over 100,000 lines, while the DMS-10 is
10 designed to serve approximately 20,000 lines⁹. The majority of Verizon's
11 switches in Illinois have fewer than 20,000 lines (of its 139 host switches in the
12 state, only ten have more than 20,000 lines, including any assigned remotes).

13 For Verizon in Illinois, the average number of lines for a host switch, including all
14 remote lines, is **XXXXXX** lines for 5ESS switches, **XXXXXX** lines for DMS-100
15 switches, **XXXXXX** lines for DMS-10 switches, and **XXXXXX** lines for GTD-5
16 switches¹⁰. Obviously, these line counts are extremely low in comparison to the
17 line count capacity of the switches.

18 **Q. WHAT DID YOU OBSERVE WITH REGARD TO REMOTE SWITCHES?**

19 A. I observed a large number of remote switches serving relatively few lines. In
20 particular, of the **XXXXXXXX** 5ESS remote switches, **XXXXXXXXXX** serve
21 fewer than one thousand lines. Based on the inputs to SCIS, these remote
22 switches have a maximum of 25,600 SM-2000 AIU Analog Lines. TELRIC

⁹ See www.lucent.com, www.nortelnetworks.com and www.agcs.com.

¹⁰ Tandem switches are excluded from these averages because they do not have any lines.

1 requires the use of actual switch locations, but the technology selection inherent
2 in Verizon's study does not size switches appropriately, given the number of lines
3 served.

4 **Q. WHAT IS THE RESULT OF MODELING OVERLY LARGE SWITCHES?**

5 A. The result of modeling these unnecessarily large switches is a significant
6 overstatement in the average investment per line, which I describe more fully in
7 the next section. Consistent with TELRIC principles, ICM should use only the
8 most efficient technologies and practices. This dictates that Verizon use
9 efficiently sized and cost effective switches, regardless of what Verizon
10 historically installed in its wire centers.

11 **Q. WERE THERE ANY OTHER ISSUES YOU FOUND WITH REGARD TO**
12 **THE SELECTION OF SWITCHING TECHNOLOGIES?**

13 A. Yes. I question whether the AGCS GTD-5 switches used by Verizon are a
14 forward-looking technology. Verizon apparently stopped installing GTD-5 *end*
15 *office* switches in 1989. In comparison, it last installed a Lucent 5ESS end office
16 switch in 1995 and a Nortel DMS-100 and DMS-10 end office switch in 1998¹¹.
17 The Arizona Business Gazette reported on November 4, 1993 that, "AG
18 Communication intends to support its installed base of GTD-5 switches (most of
19 them at telephone operating companies) for the rest of their call-handling lives –
20 perhaps the year 2000 or later." However, as I describe below, my modifications
21 to the flaws in Verizon's approach to technology selection makes this issue moot.

¹¹ See Verizon's response to Staff Request JZ 4.1 on August 28, 2001.

1 **B. Investment Issues**

2 **Q. WHAT CONCERNS DO YOU HAVE WITH VERIZON’S SUPPORTING**
3 **DOCUMENTATION REGARDING SWITCH PURCHASING?**

4 A. Verizon did not produce the actual switch contracts used to purchase 5ESS or
5 GTD-5 switches even though they last purchased a 5ESS *remote* switch in 1997
6 and a GTD-5 *remote* switch in 1998¹². Instead, they produced vendor quotes for
7 these technologies. There is no assurance that these vendor quotes relate in any
8 way to the purchasing power that Verizon has today, the purchasing power that a
9 new entrant would bring to bear when purchasing new switches to provision its
10 total network -- as required by TELRIC, or whether these quotes were obtained
11 merely to be used by Verizon in ICM.

12 Furthermore, the vendor quotes and contract purchase agreements produced by
13 Verizon are outdated. The 5ESS quote is from January 1999, the DMS-100 and
14 DMS-10 contract purchase agreements are from March 1999, and the GTD-5
15 quote is from March 1998. Given the pace of change in the telecommunications
16 industry, and reductions in switching prices in particular, these quotes and
17 purchase agreements do not reflect current conditions. Peter Huber and Evan
18 Leo, the authors of a report to the United States Telephone Association (“USTA”)
19 submitted to the FCC in 1999, stated that:

20 Costs have been driven down rapidly by advances in digital
21 technology. On a per-line basis, prices have declined 60 percent

¹² See Verizon’s response to Staff Request JZ 4.1 on August 28, 2001. I assume Verizon needed to purchase a GTD-5 remote switch in order to maintain compatibility with its assigned end office switch. Based on JZ 4.1, the end office switch was purchased on or before 1989.

1 from 1986 to 1996 and were projected to fall another 12 percent by
2 2000.¹³

3 The investments generated by the switching models and used by ICM should be
4 based on the most currently available prices.

5 **Q. WHAT CONCERNS DO YOU HAVE WITH THE SWITCHING**
6 **DISCOUNTS CALCULATED BY VERIZON?**

7 A. Verizon bases its switch discounts on the difference between switch list prices and
8 the vendor quotes and contract purchase agreements described above. Verizon
9 uses SCIS version 2.6.1 for the list prices of the Lucent and Nortel switches and
10 the AGCS list prices come directly from the vendor quote.

11 These list prices, vendor quotes and contract purchase agreements are outdated.
12 SCIS version 2.6.1 uses investment tables from 1998 for the 5ESS, DMS-100, and
13 DMS-10 switches – the same year as the GTD-5 vendor quote. If Verizon is
14 going to rely on calculated discounts – rather than providing the actual discounts
15 available from current contracts – these should be based on current list prices and
16 current contracts in order to insure they are forward-looking.

17 **Q. WHAT DID YOU OBSERVE WITH REGARD TO THE SWITCH**
18 **INVESTMENTS PER LINE GENERATED BY VERIZON'S**
19 **APPLICATION OF THE SWITCHING COST MODELS?**

20 A. When I compared the total investment per switch calculated by the switching cost
21 models to the number of lines on the switches, I observed that Verizon's approach
22 produced unusually high prices per line. The average investment per line

23 _____
¹³ USTA Comments Pursuant to Second Further NPRM Released 4/16/99 re: Implementing Local Competition, Docket 96-98, Tab #3: UNE Fact Report, Submitted by USTA, Prepared for Ameritech, Bell Atlantic, BellSouth, GTE, SBC and US West by Peter Huber and Evan Leo, May 26, 1999, at I-28.

1 developed by Verizon for Illinois was XXXXXX for 5ESS switches, XXXXXX for
2 DMS-100 switches, XXXXXX for DMS-10 switches, and XXXXXX for GTD-5
3 switches. Overall, this results in a weighted average of XXXXXXX per line in
4 Illinois and a total switch investment of XXXXXXX million dollars. These
5 investments per line are higher than the target investment per line upon which the
6 discounts were calculated.

7 **Q. WHAT CONCERNS DO YOU HAVE WITH VERIZON’S TREATMENT**
8 **OF RIGHT-TO-USE FEES?**

9 A. I could not find any supporting documentation justifying the switching right-to-
10 use fees (“RTUs”) that Verizon has included in its cost calculations. The two
11 page vendor quote for 5ESS switches makes no statement that RTUs – which
12 amount to XXXXXXX per end office – are payable in addition to the base quote.
13 Similarly, I could not find any supporting documentation justifying the
14 XXXXXXX to XXXXXXX RTUs for each DMS-100 end office or the
15 XXXXXXX to XXXXXXX RTUs for each DMS-10 end office. Furthermore, the
16 supporting documentation for the Nortel contract purchase agreement indicates
17 that a per-line operating software charge is already included in the quoted prices
18 for switches. I assume this operating software charge is the right-to-use fees. As
19 such, they are already reflected in Verizon’s discount calculations and, therefore,
20 should not be added again as a separate line item in the SCIS model inputs.

1 **Q. DID VERIZON DISCUSS RIGHT-TO-USE FEES IN ANY OF THEIR**
2 **DISCOVERY RESPONSES THAT SUPPORT YOUR ASSUMPTION**
3 **THAT RIGHT-TO-USE FEES SHOULD BE EXCLUDED FROM SCIS?**

4 A. Yes. In data request JZ 4.4, Staff asked Verizon to provide the actual purchase
5 price for the last switch purchased and compare that to the cost produced by SCIS
6 or CostMod. The most recently purchased switch was a DMS-10 end office in
7 Golconda, IL (CLLI code GLCNILXEDS0) in 1998. The actual purchase price of
8 the switch (XXXXXX) plus the site specific RTU (XXXXXX) plus the system-
9 wide RTU (XXXXXX) equals XXXXXXX which translates to XXXXXX per line.
10 The total investment produced by SCIS (XXXXXX) less the RTU included in
11 SCIS (XXXXXXXX) equals XXXXXXX, which translates to XXXXXX per line¹⁴.
12 The per-line investment from SCIS, *excluding* RTUs, is ten percent higher than
13 the actual purchase price *including* RTUs. Therefore, including right-to-use fees
14 in SCIS overstates the investment cost per line.

15 **Q. WHAT REASONS DID VERIZON GIVE FOR THIS DIFFERENCE IN**
16 **SWITCH PRICES?**

17 A. Verizon stated that the difference between the purchase price of XXXXXXX and
18 the SCIS price of XXXXXXX was due to the handling of the right-to-use fees
19 and the discounts used. Verizon states that the RTU is *excluded* from the actual
20 purchase price but *included* in the SCIS investment. However, my comparison
21 above shows that if you *add* the RTU to the actual purchase price and *subtract* the
22 RTU from the SCIS investment, the SCIS investment is still higher.

¹⁴In response to JZ 4.4, Verizon states that there is a national contract by which RTUs are allocated back to each wire center, however, this contract is not part of Verizon's supporting documentation.

1 Verizon also stated that an average discount was used as an input to SCIS, but that
2 a site-specific discount would have been used with the actual purchase price.
3 Using the site-specific discount dramatically drops the switch investment. This
4 site-specific discount (XXXXXX) is XXXXXX points higher than the average
5 discount (XXXXXX). The resulting purchase price from using the higher, site-
6 specific discount is thirty-one (31) percent less than what would be paid by using
7 the average discount¹⁵. The average discount is obviously too low, which
8 overstates investment.

9 **Q. HOW DOES VERIZON'S RESPONSE TO JZ 4.4 SUPPORT YOUR**
10 **CONCERNS REGARDING SUPPORTING DOCUMENTATION AND**
11 **DISCOUNTS?**

12 A. Verizon's response supports my concerns that Verizon should not rely upon the
13 vendor quotes and contract purchase agreements or the calculated discounts. The
14 XXXXXX site specific discount is higher than *any* of the discounts used to
15 calculate the average discount for the DMS-10 switches¹⁶. The vendor quotes and
16 contract purchase agreements relied upon by Verizon are not representative of
17 what Verizon actually pays for switching. Since the discounts are calculated
18 using these vendor quotes and switch purchase agreements, the discounts are too
19 low. These two issues overstate the amount of switch investment in Illinois.

¹⁵ The Purchase Price = List Price * (1 – Discount), therefore, XXXXXXXXXXXXXXXXXXXX.

¹⁶ Refer to the file IL Discount.pdf provided by Verizon in its supporting documentation.

1 **C. Growth Issues**

2 **Q. DO YOU AGREE WITH VERIZON’S USE OF THE INVESTMENT**
3 **ADJUSTMENT FACTOR WITHIN ICM AND ITS ACCOUNTING FOR**
4 **GROWTH?**

5 A. No. Verizon attempts to reflect growth in its calculation by employing an
6 investment adjustment factor (“IAF”). The IAF is developed by calculating
7 incremental investment associated with line and trunk growth for each of six years
8 following the initial switch installation (the amount of growth depends on the type
9 and size of the switch). These incremental investments are discounted back to a
10 present value, and the IAF is calculated by taking the sum of the initial purchase
11 price plus the present value of the incremental investment associated with growth,
12 and dividing that by the initial purchase price.

13 There are two problems with Verizon’s calculations. First, as I indicated above,
14 while it is inappropriate for an efficient telecommunications provider to select
15 oversized switches, it is equally inappropriate for an efficient provider to install
16 only enough lines to handle the current demand without also initially installing
17 some additional lines to handle anticipated growth in the short-run. Therefore, I
18 would expect an efficient provider to experience little or no growth in additional
19 lines beyond those initially installed for the first year or two.

20 Furthermore, any increases in line counts, beyond the first two years, are not
21 likely to cost more than the initial cost per line. This is because switching prices
22 are continually dropping. The projected rate of reduction in prices should offset
23 the incremental costs per line used by Verizon.

1 The second problem with Verizon's calculations is that while it includes the
2 present value of the incremental investment in the numerator, it fails to include
3 the present value of the additional line counts in the denominator of the cost per
4 line calculations. As a result, there is a mismatch between the present value of the
5 investments and the present value of the demand that will bear those investment
6 costs. This is the equivalent of requiring today's demand to pay for tomorrow's
7 new customers.

8 **D. Switching Cost Model Input Issues**

9 **Q. ARE YOU SATISFIED THAT THE INPUTS INTO THE SWITCHING**
10 **COST MODELS ARE APPROPRIATE?**

11 A. No. I found that Verizon used extremely low processor utilization factors and that
12 there is a mismatch between the call completion ratio used in ICM and the ratio
13 used in SCIS.

14 **Q. WHAT IS WRONG WITH THE PROCESSOR UTILIZATION FACTORS**
15 **USED BY VERIZON IN THE SCIS SWITCHING MODEL?**

16 A. The processor utilization factors calculated by Verizon are extraordinarily low.
17 The processor utilization factor indicates how much demand is placed on the
18 central processing unit of the switch. These low processor utilization factors are
19 another indication that Verizon has overbuilt its switching network and/or that its
20 technology selection is economically inefficient.

21 I could not determine how Verizon calculated these processor utilization factors
22 from the supporting documentation provided by Verizon. Because Verizon treats
23 the "getting started cost" of a switch as a volume sensitive cost, a lower processor

1 utilization factor translates into a higher getting started investment per minute of
2 use¹⁷.

3 **Q. WHAT IS YOUR REACTION TO THE CALL COMPLETION RATIO**
4 **USED BY ICM AND SCIS?**

5 A. Verizon uses different call completion ratios in the SCIS model than it uses in
6 ICM. The call completion ratio is the percentage of calls that reach the intended
7 recipient. ICM uses a call completion ratio of **XXXXXX** percent. SCIS uses a call
8 completion ratio of **XXXX** percent. Obviously, not every call reaches its intended
9 recipient. Therefore, SCIS uses an unreasonably high call completion ratio.

10 **E. Factors Issues**

11 **Q. WHAT ISSUES DID YOU FIND WITH THE ENGINEERING, FURNISH**
12 **& INSTALL FACTORS USED BY ICM?**

13 A. I consider the engineering, furnish & install (“EF&I”) factors calculated by
14 Verizon as extremely high and not forward-looking as required by TELRIC.
15 They average between **XXXXXXXXXX** percent and **XXXXXXXXXX** percent
16 depending on the type of switch. These EF&I factors are additive to the
17 switching investment and are supposed to account for the engineering and
18 installation required by Verizon for installing a switch. The size of these factors
19 overstates the amount of switch investment in Illinois.

¹⁷ The “getting started cost” of a switch is that equipment, including memory and processors, that is purchased as part of a fixed getting started cost that does not vary with respect to usage or features.

1 **IV. ICM COST CALCULATION ISSUES**

2 **Q. WHAT ISSUES DID YOU FIND WITH HOW VERIZON CALCULATES**
3 **SWITCHED ACCESS COSTS?**

4 A. I found problems with how Verizon applies the principle of cost causation in its
5 calculation of switched access costs, and problems with the elements included in
6 Verizon's switched access costs.

7 **Q. WHAT PROBLEM DID YOU FIND WITH HOW VERIZON APPLIED**
8 **THE PRINCIPLE OF COST CAUSATION?**

9 A. The cost causation principle dictates that the element causing the cost should bear
10 that cost. Switches are constrained either by the limits of their processors or by
11 the number of ports. Switches are basically large computers, and advances in the
12 computing technologies associated with memory and processing power have
13 increased the usage capacity of digital switches. Therefore, today's digital
14 switches rarely reach capacity (or "exhaust") by exceeding the capabilities of the
15 processor. Instead, they exhaust when there are no longer any available ports.

16 As stated earlier, Verizon's own calculations of very low processor utilization
17 factors also strongly suggests that switches are port constrained rather than
18 processor constrained. Otherwise, Verizon's calculated processor utilization
19 factors would be much higher.

20 Because of this, the getting started cost should be allocated to the port, or volume
21 insensitive cost, not to switch usage, or the volume sensitive cost. While this
22 increases the UNE port cost, this would be offset by reducing the call setup cost
23 element of switch usage. Verizon assigns at least some of the getting started

1 investments to switch usage by using SCIS to develop the usage investments.

2 This violates the cost causation principle.

3 **Q. DO YOU AGREE WITH THE GENERAL CATEGORIES OF COSTS**
4 **THAT VERIZON INCLUDED IN CALCULATING ITS SWITCHED**
5 **ACCESS COSTS?**

6 A. No. Verizon included marketing costs in its calculation of switched access costs.

7 Switched access service is not something that needs to be marketed since the

8 IXC's have no choice but to use the end user's local exchange provider's access

9 service to originate or terminate a toll call. Verizon does not incur marketing

10 costs for switched access, so these costs should be excluded from any cost

11 calculations.

12 **V. ICM INPUT ADJUSTMENTS AND RESTATEMENT**

13 **Q. WERE YOU ABLE TO MODIFY ICM IN ORDER TO CORRECT THE**
14 **FLAWS AND DEFICIENCIES YOU IDENTIFIED IN SECTIONS III, IV**
15 **AND V?**

16 A. I was able to modify inputs to ICM to correct most, but not all, of the deficiencies
17 in Verizon's switched access cost study identified above.

18 **Q. HOW WERE YOU ABLE TO COMPENSATE FOR THE TECHNOLOGY**
19 **SELECTION ISSUES AND INVESTMENT ISSUES?**

20 A. In order to compensate for the technology and investment issues discussed above,

21 I created a new investment adjustment factor that adjusts the investments output

22 by the SCIS and CostMod switching models.¹⁸ The investments per line output

¹⁸ By adjusting the outputs of the switching models, instead of the inputs to the switching models, I avoided having to rerun the switching models, generating thousands of pages of output reports in order to populate the ICM switching investment table.

1 by the switching models differed from the target price per line that Verizon's
2 discounts were supposed to achieve. To correct this discrepancy, I created an
3 investment adjustment factor that equated the switching investment to those target
4 prices per line.¹⁹ For each switch, I examined all of the possible technologies and
5 used the technology that yielded the lowest target price per line for the number of
6 lines in each wire center.

7 This methodology corrects a number of ICM flaws. By using the technology that
8 produces the lowest target price per line, I am consistent with TELRIC, which is
9 designed to employ the most economically efficient technology. In addition, my
10 approach eliminates the problem with right-to-use fees by setting the switching
11 investment equal to the target prices, which appear to include right-to-use fees²⁰.
12 This also eliminates the upward adjustment in costs that is inherent in Verizon's
13 growth-based investment adjustment factor.

14 However, this methodology does not adjust for the fact that the switch
15 investments employed by Verizon are outdated and overstated.

16 **Q. HOW WERE YOU ABLE TO COMPENSATE FOR THE SWITCHING**
17 **COST MODEL INPUT ISSUES?**

18 A. As described above, the low processor utilization factors serve to increase the
19 getting started investment that Verizon associates with the usage component of
20 end-office switching. But as I explain above, cost causation principles dictate that

¹⁹ The target investments per line are identified in the "SCIS Costmod Disc Dev.pdf" file produced by Verizon.

²⁰ For example, using the switch from Verizon's response to JZ 4.4, the investment using my investment adjustment factor becomes XXXXXX which is still higher than Verizon's actual purchase price plus RTUs of XXXXXX per line.

1 these costs should be allocated to the port, not to usage. In my restatement of
2 Verizon's costs, I eliminated the getting started costs from the call setup elements
3 of the switch usage feature investments developed by SCIS. Although CostMod
4 does not separately identify getting started investments, these costs are
5 nonetheless included by Verizon in its switch usage cost. To correct for this
6 overstatement, I reduced the call setup elements of the switch usage feature
7 investments developed by CostMod for the GTD-5 switches by the smallest
8 average reduction percentage identified for any of the three technologies (*i.e.*, the
9 5ESS, DMS-100 and DMS-10) from SCIS, which does segregate getting started
10 costs. Use of the smallest average reduction percentage is conservative. My
11 approach still does not correct for the fact that the SCIS usage features use a call
12 completion ratio that is too high.

13 **Q. HOW WERE YOU ABLE TO COMPENSATE FOR THE HIGH EF&I**
14 **FACTORS USED BY ICM?**

15 A. In a recent ruling by the New York State Commission involving Verizon, an
16 EF&I factor of thirty (30) percent was found reasonable²¹. I set the ICM EF&I
17 factor to 1.3.

18 **Q. HOW WERE YOU ABLE TO COMPENSATE FOR THE INCLUSION OF**
19 **MARKETING EXPENSES IN THE SWITCHED ACCESS COSTS?**

20 A. The product and services output report from ICM identifies the investment,
21 depreciation & return, composite income tax, property taxes, maintenance &

²¹ State of New York Public Service Commission, Case 98-C-1357 - Proceeding on Motion of the Commission to Examine New York Telephone Company's Rates for Unbundled Network Elements, Recommended Decision on Module 3 Issues by Administrative Law Judge Joel A. Linsider, pp 140 to 142, (May 16, 2001).

1 support, marketing and billing, collection & directory costs for each switched
2 access cost element. I excluded the marketing costs from the calculations.

3 **Q. WHAT IMPACT DID THESE ADJUSTMENTS HAVE ON THE**
4 **SWITCHED ACCESS COSTS PRODUCED BY ICM?**

5 A. Making the adjustments I recommend reduced both the end office switching and
6 tandem switching cost elements of the switched access cost study. The following
7 table compares Verizon costs calculated using ICM and my costs using
8 adjustments to ICM, calculated on a minute of use basis, including Verizon's
9 common cost allocator:

Element	Verizon LRSIC + Common	Restated LRSIC + Common	Percent Reduction
End Office Switching	\$0.0060342	\$0.002869	-52%
Tandem Switching	\$0.0020470	\$0.001499	-27%

10

11 As the table shows, these corrections to ICM's inputs equate to a 52 percent and
12 27 percent reduction in the end office switching and tandem switching costs,
13 respectively.

14 **VI. COMPARISON OF RESTATED COSTS TO OTHER VERIZON COSTS**

15 **Q. HOW DO THESE RESTATED COSTS COMPARE TO OTHER COSTS**
16 **CALCULATED BY VERIZON?**

17 A. Verizon's current switched access costs for end office switching and tandem
18 switching are **XXXXXXXX** and **XXXXXXXX** per minute of use, respectively.
19 While Verizon's costs compared to their current costs show an upward trend, my
20 restated costs show a downward trend in costs. This downward trend is what one

1 would reasonably expect, given the declining trend in the prices of digital
2 switching equipment. In response to Staff request JZ 5.8, Verizon declined to
3 address why its switched access costs for these elements are higher than its
4 current costs. It notes that the current costs were produced in 1996 by a model
5 that only represented a sample of switches. While I have not reviewed that 1996
6 model, I would be surprised if Verizon had understated its costs. If these earlier
7 results are not representative of Verizon's costs, I would expect them to be a cost
8 ceiling given that my restatement here served to lower costs.

9 **VII. CONCLUSIONS**

10 **Q. WHAT ARE YOUR CONCLUSIONS REGARDING THE USE OF**
11 **VERIZON'S ICM TO CALCULATE SWITCHED ACCESS COSTS IN**
12 **ILLINOIS?**

13 A. I recommend that, at a minimum, the Illinois Commission reject the use of ICM to
14 calculate switched access costs in Illinois. While I was able to adjust the inputs to
15 ICM and restate selected costs, I did so after a great deal of research and did not
16 find that the model was particularly open to inspection or flexible. Lastly, the
17 costs Verizon calculated by using ICM generated costs that are higher than their
18 current switched access costs, which is counterintuitive to the recent trend of
19 digital switching costs in general.

20 **Q. DOES THIS CONCLUDE YOUR TESTIMONY?**

21 A. Yes, it does.